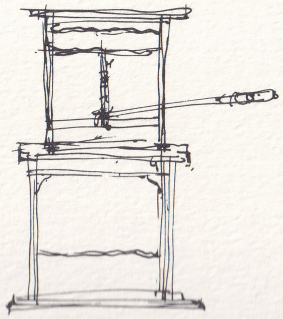
PHOTON 200

new dimensions in photocomposition

typesetting began in

1440

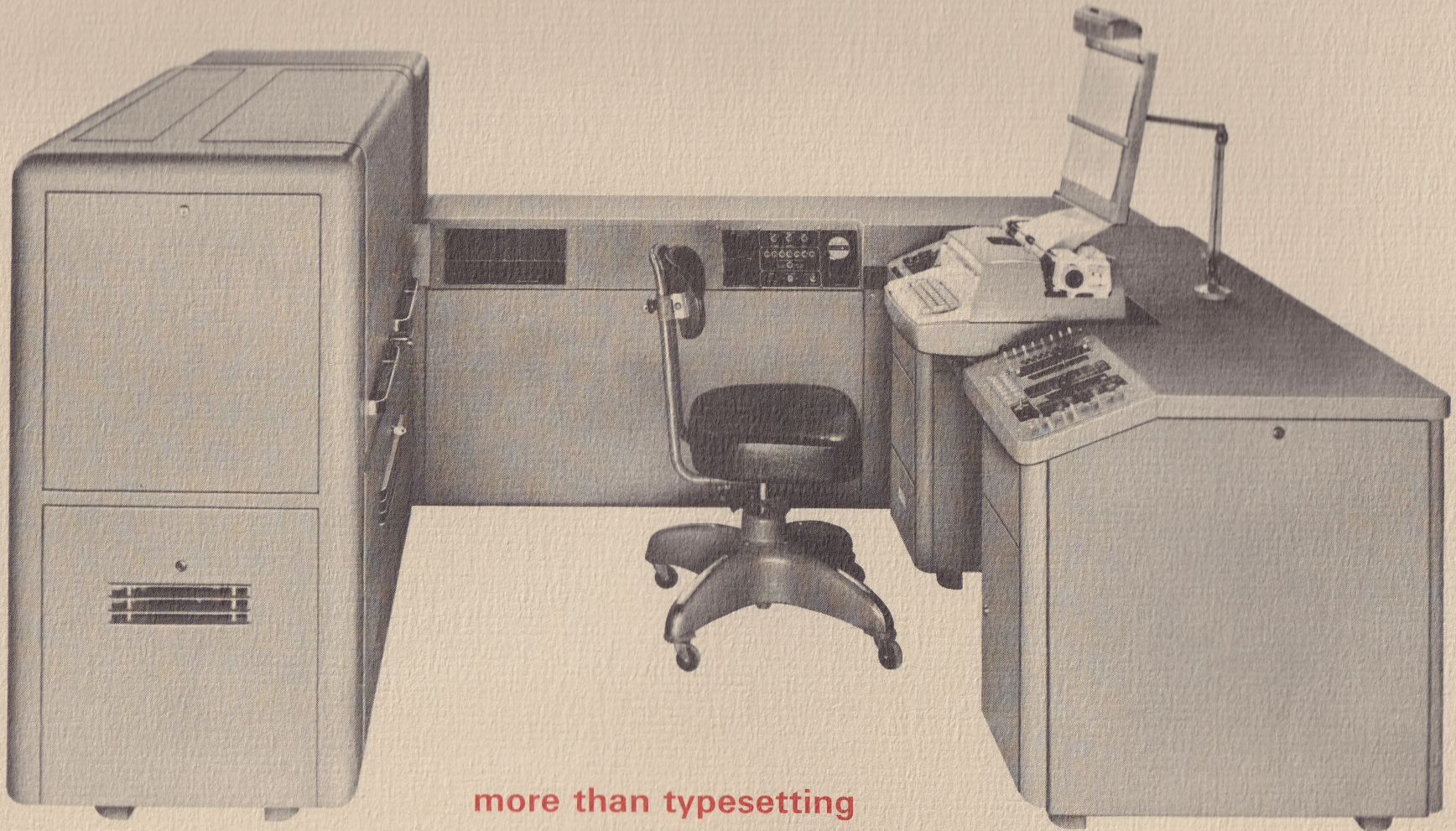
when . . . .



Johannes Gutenburg gave the world his invention. Movable type—a new force in the Old World—added new dimension to the prime art of communications.

The American machine age advanced typesetting again. A lineseting machine was invented.

20th century technology pioneered a wider dimension in the dynamic art of typography. Photon introduced a unique phototypesetter. Not only single characters, not only lines of characters but complete and complex typographic formats are produced directly from the keyboard.



more than typesetting

more than linesetting

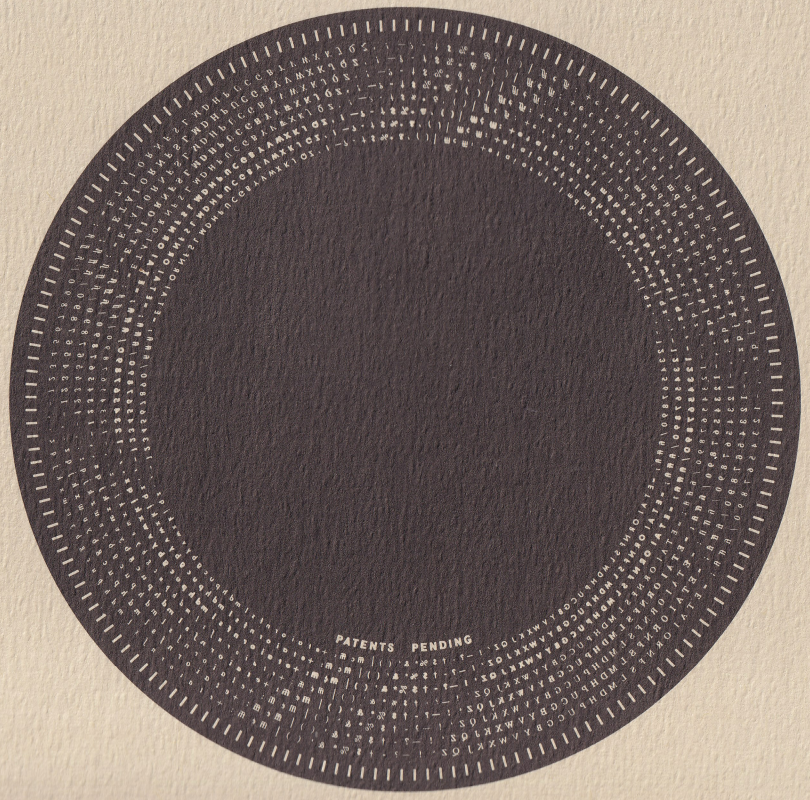
PHOTON 200

produces completed copy block composition directly at the keyboard.

Operator controls give the Photon compositor complete command over each element in copy block composition. All styles and type sizes are mixed freely at will. All useful spacing or position functions are instantly available at fingertip reach. Photon makes composition easy.

True area composition is a fact with Photon. Any type style or size is accurately placed in horizontal or vertical location. Characters cast from the keyboard are automatically controlled. Lines are justified, centered, quadded left or right with push button ease.

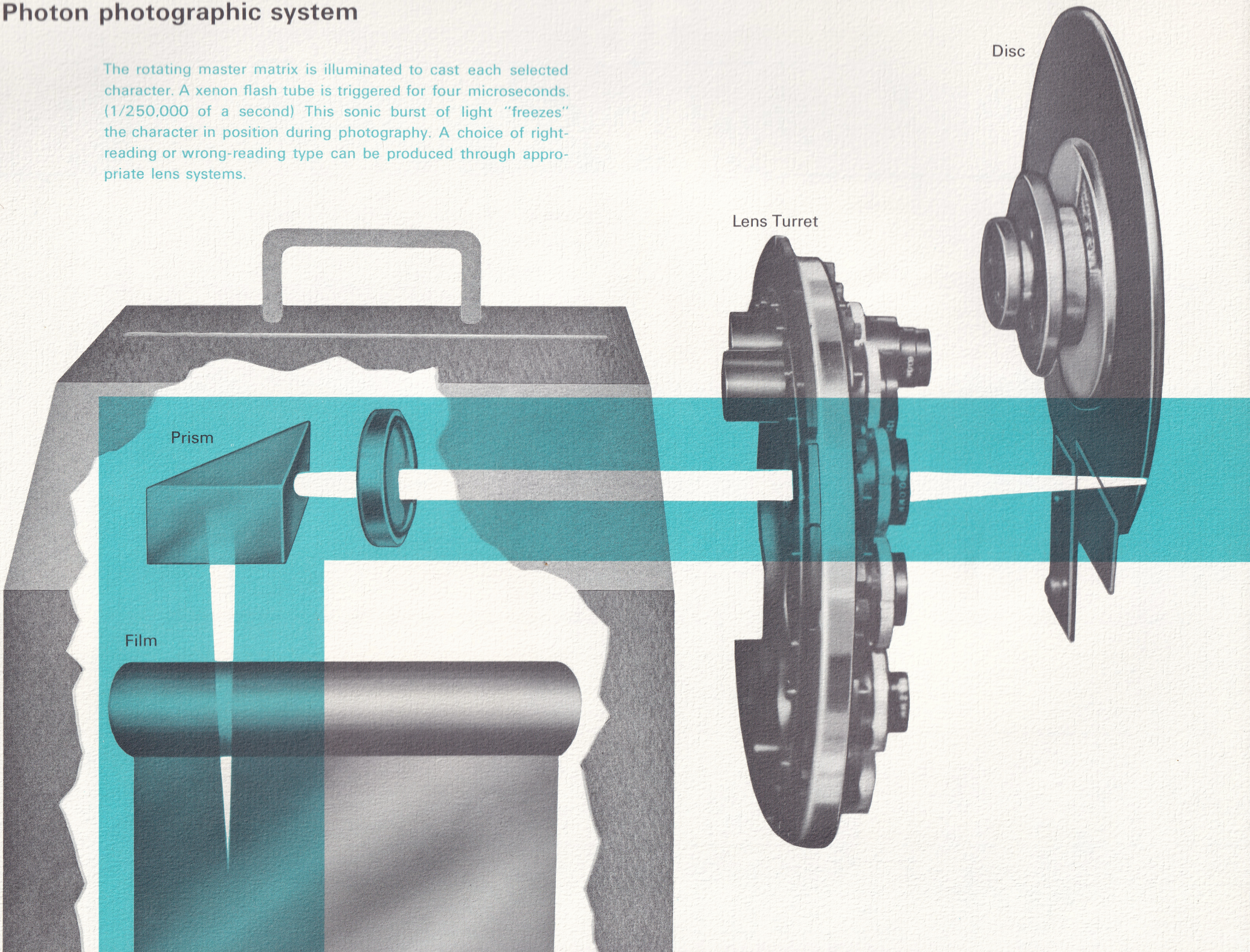
The heart of Photon composition is the master matrix disc. Complete, 90 character, 6 point fonts in 16 styles, are arranged on the eight inch disc. Each font can be sized with any one of 12 lenses. From each disc, 192 type fonts are instantly available to the operator—a total of 17,280 characters in all.



PHOTON matrix system

Photon photographic system

The rotating master matrix is illuminated to cast each selected character. A xenon flash tube is triggered for four microseconds. (1/250,000 of a second) This sonic burst of light "freezes" the character in position during photography. A choice of right-reading or wrong-reading type can be produced through appropriate lens systems.



MIX ANY STYLE AND SIZE WITHOUT CHANGING *LINE LENGTH*

Every *family*, size or style available *at the operator's* keyboard may be placed in the line being *composed.* Not only can *type styles* **be mixed within a line,** but point sizes and families **may also be mixed** without interfering *with justification or* alignment.

Photon keyboarding permits freedom of style and size mixing—on the same line—at full keyboard speed. Justification and base alignment are perfect.

Photon's built-in computer automatically calculates the correct width value for each character. *Operator calculations are eliminated.*

Automatic centering, quadding

When the CENTER button is pressed, whatever has been keyboarded will be photographed and centered on the pre-set line length. This is accomplished automatically, irrespective of differences in type styles or sizes within the line or from one line to another.

A word
or group of words
is **centered** automatically
by
simply pushing a button.

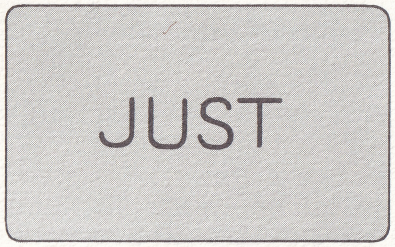
The FLUSH RIGHT button automatically quads right, in selected line length, whatever has been keyboarded. The CENTER, FLUSH RIGHT and FLUSH LEFT buttons are used instead of the JUSTIFICATION key for this type of composition.

A word
or group of words
is set **flush right**
by
simply pushing a button.

The FLUSH LEFT button automatically produces non-justified (quad left) lines. This control is used when within justification range and justification is not desired. (If a line is not within justification range, it is automatically sent flush left.)

A word
or group of words
is set **flush left**
by
simply pushing a button.

PHOTON



Automatic justification

Justification is entirely automatic. The operator merely touches the JUST key at the end of each line. The first example shows how justifying space is automatically added between the words as the line length is increased.

The second example is a graphic illustration of Photon's positive justification system. No guesswork or operator judgment is involved to set narrow measure copy. Letterspacing is entirely automatic.

Justification is entirely automatic with Photon. The operator merely touches the JUSTIFICATION key at the end of each line.

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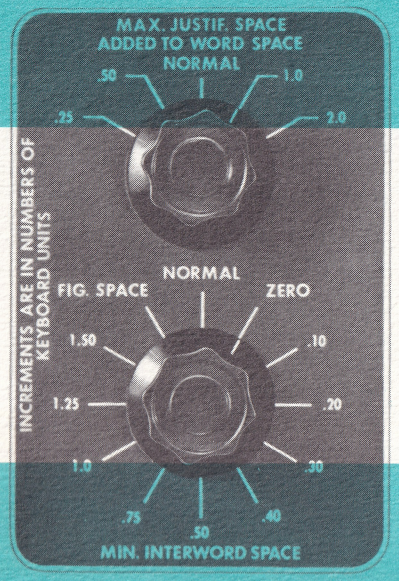
Includes 2 glass panels, 1 aluminum screen, Z bar outer frame. Hardware, pneumatic door closer; rustproof aluminum.

Includes 2 glass panels, 1 aluminum screen, Z bar outer frame. Hardware, pneumatic door closer; rustproof aluminum.

Includes 2 glass panels, 1 aluminum screen, Z bar outer frame. Hardware, pneumatic door closer; rustproof aluminum.



Control "tight" and "loose" lines

Photon has unique controls to meet copy-fitting problems. It is possible to "stretch" or "squeeze" a line quickly. Photon thus saves tedious hand work that might otherwise be necessary.

The top dial controls the maximum, allowable spread of interword spaces. The lower dial allows the operator to pre-select a minimum value for interword space. These dials permit complete flexibility of spacing to meet the requirements for any kind of composition.

It is for us, the living, rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced.

It is for us, the living, rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced.

The Constitution of the United States

The Constitution of the United States

Justified lines of different point sizes on the same line length

When setting justified lines of different point sizes on a given line length, there is no need to change justification setting. When the justifying and word space dials are set on NORMAL, the correct spacing for any point size or combination of sizes is controlled automatically without operator calculation.

Ease in handling "run arounds"

Photon composition can be placed alongside art without limitation. "Run arounds" are easily handled by rapid change of line length. The LINE LENGTH "set" button is shown here. A range of 900 pre-selected line lengths up to 54 picas is available to the Photon operator by means of this control.

The Photon matrix disc consists of a durable glass

plate 8" in diameter and 1/8" thick on which 16 semi-circles of type are placed in negative character form. Each semi-

circle contains a complete 90-character alphabet. These sixteen type styles combined with twelve lens sizes mean that the equiv-

alent of 192 fonts of type are available from a single disc—a total of 17,280 characters in all. Lens sizes range from 5 point to 72 point. The Photon disc rotates continuously at

a speed of 10 revolutions per second. A beam of light from a stroboscopic flash tube illuminates characters desired from the rotating disc and projects their images through appropriate lenses onto film or

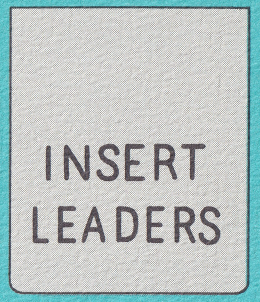
photographic paper. Because it has no wearing surfaces or moving parts, a Photon disc with reasonable care should last indefinitely. Eliminated completely is the need to replace worn or damaged matrices.

Photon provides a proofing typescript showing the characters selected and the controls used—*prior to photography*. Corrections are made on individual words or characters. Entire lines can be "killed". Photon's direct, visual presentation, coupled with unique correction ability can virtually eliminate errors in the finished product.

Precise, versatile and automatic, Photon provides the ultimate ability to mix sizes and families of type regardless how often line length or location are varied in a layout—and all at keyboard speeds.

Automatic insertion of leaders and blank space

The INSERT LEADERS key is invaluable for catalog and directory composition. The selected space is automatically filled with the correct number of leaders, dashes or any other symbol or character selected from the master library.



Vanderkin Amos . . . . . **LA 8-2832**
Vanderkin Arthur . . . . . **LA 8-3204**
Vanderkin Ben . . . . . **LA 8-2203**
Vanderkin Harold . . . . . **LA 8-2684**
Vanderkin Harry . . . . . **LA 8-2925**
Vanderkin Robert . . . . . **LA 8-2683**
VanderLaan D A. . . . . . **TR 6-2891**
Vander Sande Alden 417 Caroline . . . **TW 2-8058**
Van Ells Elsie Mrs 210 Forest Av . . . . **TW 2-7906**

Wagner Claude RFD 1 Malone . . . . **Jhnbrg 1-F12**
Wagner Clem RFD 1 . . . . . **Mt Clvry 94-J**
Wagner Edward J 28 Park Pl. . . . . **TW 2-2134**
Wagner Emmett RFD 1 Malone . . . **Jhnbrg 25-F22**
Wagner Erhard RFD 1 . . . . . **Mt Clvry 67-F11**
Wagner Leo RFD 1 Malone . . . . . **Jhnbrg 34-F4**
Wagner Leo V . . . . . **Mt Clvry 19**
Wagner Libor J well drilling RFD 1 . . **Mt Clvry 22-J**
Wagner Paul . . . . . **Mt Clvry 89-W**

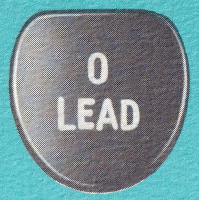
The INSERT BLANK key functions in exactly the same way as the INSERT LEADERS key except that blank space is automatically quadded in the line at the point where the key is depressed.

New York—Pennsylvania—Maryland—Virginia—South Carolina—Georgia

Southington Hdwe. Mfg. Co. **MI 4-9264**
Sanson & Rowland, Inc., 186 W. Louden, Phila
Spence Engineering Co., Inc. **RE 2-0305**
Strachan-MacKoe Corp., 90 West, NY
Sperry Gyroscope Co. **MA 5-5600**
T. J. Ford, 81 Willoughby, Brooklyn
Straus-Duparquet, Inc. **AL 4-3600**
33 E 17th, NY
Taylor Instrument Companies **JU 6-3544**
45 Rockefeller Plaza, NY

Flexitallic Gasket Co. **LE 0787**
Tate Engineering & Supply Co., 516 S. Eutaw, Balt
Flexitallic Gasket Co. **NO 2-3683**
Empire Machiner Co., 414 Water, Norf
Foster Wheeler Corp. **RI 6-2888**
Packard Bldg., Phila
Garlock Packing Co. **TU 9-2686**
2828 Lock Raven, Balt
Garlock Packing Co. **6-1991**

The ZERO LEAD function is used when it is desired that the photographic material remain stationary in the magazine after a line has been photographed. An example of this application is at the right.



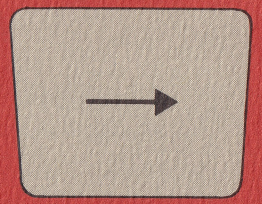
Shop! Now! Save!

The above is actually two lines, superimposed. The first line automatically quadded Shop! and Save! flush left and flush right, respectively. The line centering Now! was superimposed by means of the Zero Lead button.

Ease in making corrections

To make corrections before photography, the Photon operator has two choices—a line can be "killed" entirely or individual characters can be changed within the line.

The latter capability, unique to Photon equipment, is accomplished by the BACKSPACE key. When an error is caught—instinctively or from the typescript—the operator simply touches the BACKSPACE key which removes the previous coded information for each character in error. The "memory" unit is then free to accept the proper code information. There is virtually no loss in typing speed.



Original typescript

```
dl Fourscore^and^seven^years^ago^our^fathers^brought^forth
on^this^ontinent^a^new^nation,^c
on^this^continent^a^new^nation,^conceived^in^liberty,^and
dedicated^to^the^p~~oposition~~
                  roposition^that^all^men^are^created^~~equal~~
equal.
 Now^we^are^engaged^in^a^great^civil^war,^testing^whether
that^nation,^or^any^nation^so^conceii~~
                                  ved^and^so^dedicated,^~~can~~
can^long^endure.^We^are^met^on^a^great^battlefield^of^that
war.^We^have^come^to^dedicate^a~~;~~
                                ^portion^of^that^field^as^a
~~f~~
final^resting-place^for^those^who^here^gave^their^lives^that
that^nation^might^live.^It^is^altogether^fitting^and^proper
that^we^should^do^this.
```

Finished composition

Fourscore and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

Multiple justification

In addition to its application for business forms, tabular matter, column headings and parallel columns, the MULTIJUST key is useful in display and book composition. Another important example is setting small type on a long measure without showing a "butt" line. No leading takes place when MULTIJUST is used.

STATES OF THE UNION

STATE	Year Admitted	Population (In nearest thousands) Per 1950 Census	Area Square Miles (Total)	Density of Population Per Square Mile
Alabama	1819	3,062	51,609	59.9
Arizona	1912	750	113,909	6.6
Arkansas	1836	1,910	53,104	36.3
California	1850	10,586	158,693	67.5
Colorado	1876	1,325	104,247	12.8
Connecticut	1788	2,007	5,009	286.4
Delaware	1787	318	2,057	160.8
District of Columbia		802	69	13,150.5
Florida	1845	2,771	58,560	51.1

Fourscore and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

Special typographic features

Kerning and special fitting of characters are accomplished far more easily with Photon than in metal. The CHANGE SET ONLY button is used frequently for this purpose. More than 80 different set-widths are available with Photon.

In the first of the adjoining examples, the set-width of the initial letter in each word is reduced in successive lines to illustrate the range of possible typographical fitting. In the second, the same line has been set six times, employing different set-widths, illustrating further the flexibility of "fit" which this control makes possible.

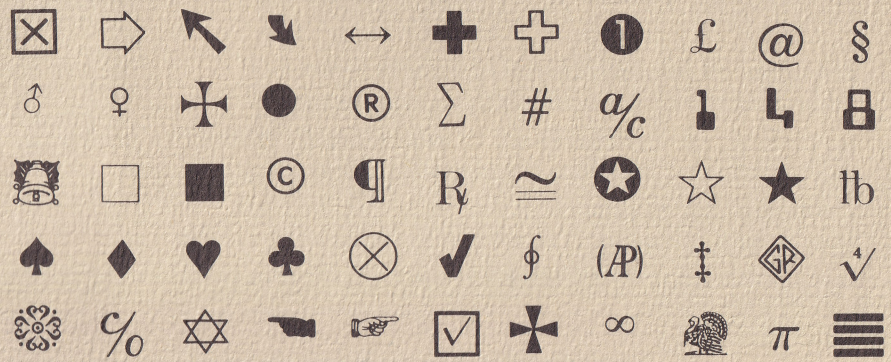
Very You Tree Word AWAY
Very You Tree Word AWAY
Very You Tree Word AWAY

11 pt. body, 10 1/2 set — More than 80 set-widths are available on Photon
11 pt. body, 10 3/4 set — More than 80 set-widths are available on Photon
11 pt. body, 11 set — More than 80 set-widths are available on Photon
11 pt. body, 11 1/4 set — More than 80 set-widths are available on Photon
11 pt. body, 11 1/2 set — More than 80 set-widths are available on Photon
11 pt. body, 11 3/4 set — More than 80 set-widths are available on Photon

While the NO FLASH button is depressed, the space for characters keyboarded is allowed on the photographic material, but the characters will not be photographed. This control is particularly useful in the spacing of initials.

BUT in a larger sense we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead, who struggled here, have consecrated it far above our poor power to add or detract. The world will little note, nor long remember, what we say here; but it can never forget what they did here.

Photon flexibility is greatly enhanced by use of the PI MAT attachment which makes available characters and symbols not on the matrix disc. Any of eight different pi characters may be keyboarded at a given time. An unlimited quantity of additional pi mats — easy to make and low in cost — may be substituted as required.



PHOTON

one machine

one operator

one operation

key to savings through Photon

The unique Photon approach to composition is based on intensive research conducted over the past decade directed toward development of an "ideal" composing machine. The objective was to produce a machine which would enable the operator to perform as large a part of the composing job as possible directly at the keyboard. This has been achieved by vastly increasing the range of type styles and sizes available, simplifying and speeding up keyboarding functions, and facilitating direct makeup from the keyboard.

The soundness of the Photon approach has been proven out in actual production usage. Photon machines have been installed successfully by newspapers, business forms manufacturers, trade composition houses, commercial and specialty printers. Its superiority over conventional methods of typesetting has been thoroughly documented, both by independent authorities as well as by Photon users.

The key to savings through Photon thus lies in its single-step operation with the productive capacity of the individual operator increased to the point where his own "product" is finished composition ready for plate-making. Other photocomposition systems which involve multi-stage processing and which require additional equipment, personnel and materials, do not offer this fundamental economic advantage.

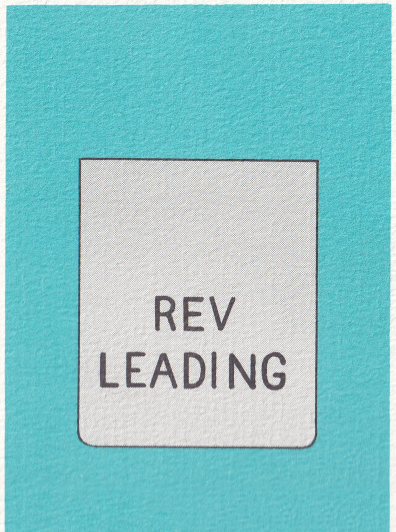
Time saving control

REVERSE LEADING—the ability to reverse feed photographic material by exact leading increments (from 1/10 point to any amount) allows a Photon operator to compose complicated copy blocks or in-line point size mixes with a minimum of machine changes. No special operator computation is necessary in order to mix point size within a line. Maximum composition at the keyboard saves time and money otherwise spent in additional paste makeup.

TIME AND MONEY SAVED WITH INCREASED PRODUCTION

This graphic representation of a double-truck grocery ad, set by Photon 200, clearly illustrates Photon superiority. The most obvious advantage is the ability to keyboard in the larger point size range without manual machine changes.

Twenty items set through the use of the reverse leading feature accounted for substantial savings in machine operation. Forty lines of type required one line length setting, three typeface settings and three point size settings on Photon 200.



PARTIAL LIST OF PHOTON USERS

Newspaper Installations

Allentown Call-Chronicle
Allentown, Pa.

Ashtabula Star-Beacon
Ashtabula, Ohio

Birmingham News Company
Birmingham, Ala.

Bloomington Daily Pantagraph
Bloomington, Ill.

Boston Herald-Traveler
Boston, Mass.

Calgary Albertan
Calgary, Canada

Chicago Sun-Times and Daily News
Chicago, Ill.

Coeur d'Alene Press
Coeur d'Alene, Idaho

East Africa Newspapers, Ltd.
Kenya, South Africa

Fairmont Daily Sentinel
Fairmont, Minn.

Fort Worth Shopper
Fort Worth, Texas

Greater Buffalo Press, Inc.
Buffalo, N.Y.

Honolulu Press Newspapers, Inc.
Honolulu, Hawaii

Johnstown Tribune-Democrat
Johnstown, Pa.

Louisville Courier-Journal & Times
Louisville, Ky.

Minneapolis Star & Tribune
Minneapolis, Minn.

Nashville Tennessean & Banner
Nashville, Tenn.

Newark Star-Ledger
Newark, N.J.

New York Times
New York, N.Y

Norfolk Virginian-Pilot Ledger-Dispatch
Norfolk, Va.

Midwest City Journal
Midwest City, Okla

Omaha World-Herald
Omaha, Neb.

Philadelphia Bulletin
Philadelphia, Pa.

Phoenix Evening American
Phoenix, Ariz.

Portland Oregonian
Portland, Ore.

Patriot-Ledger
Quincy, Mass.

Rockland Independent
Suffern, N.Y.

Santa Maria Times
Santa Maria, Calif.

Spokesman-Review & Chronicle
Spokane, Wash.

Syracuse Herald-Journal
Syracuse, N.Y.

Valley Daily News
Tarentum, Pa.

Wausau Record-Herald
Wausau, Wisc.

West Palm Beach Post-Times
West Palm Beach, Fla.

Windsor Star
Windsor, Ontario

Yonkers Herald Statesman
Yonkers, N.Y.

Commercial Installations

Ahlen & Akerlund Dorlags, AB
Stockholm, Sweden

Aller Press, Ltd.
Copenhagen, Denmark

American Chemical Society
Applied Publications
Washington, D.C.

American Mathematical Society
Providence, Rhode Island

Black Dot, Inc.
Crystal Lake, Illinois

Broadway Offset Plate Co., Inc.
Milwaukee, Wisconsin

Bru-El Graphic
Bailey's Crossroads, Virginia

Coronet Thermogravers
Providence, Rhode Island

Documentation Incorporated
Bethesda, Maryland

Dumont Printing & Publishing
La Salle, P.Q., Canada

Eastman Kodak Company
Rochester, New York

Edwards Brothers, Inc.
Ann Arbor, Michigan

Graphic Controls, Inc.
(Clarkson Press)
Buffalo, New York

The Knight Press
Baltimore, Maryland

Eli Lilly & Company
Indianapolis, Indiana

Machine Composition Company
Boston, Massachusetts

Mail Equipment Corporation
Hartford, Connecticut

Michigan Typesetting Company
Detroit, Michigan

Mid-Atlantic Photo Composition, Inc.
Baltimore, Maryland

Missouri Photo Engravers
Kansas City, Missouri

Moore Business Forms, Inc.
Niagara Falls, New York

Photoplate, Inc.
Keene, New Hampshire

R. L. Polk & Co.
Detroit, Michigan

Publishers Graphic Arts Service, Inc.
Skokie, Illinois

Regency Thermographers
New York, New York
North Hollywood, California

Science Press, Inc.
Ephrata, Pennsylvania

Shelby Business Forms, Inc.
Shelby, Ohio

Time Incorporated
New York, New York

Top Hat Typographic
Rockford, Illinois

Twin City Graphic Photon
St. Paul, Minnesota

UARCO Incorporated
Chicago, Illinois
Deep River, Connecticut
Oakland, California
Paris, Texas
Watseka, Illinois
Riverside, California

U.S. Department of Defense
National Security Agency
Washington, D.C.

U.S. Department of the Interior
Geological Survey
Washington, D.C.

Wyeth Laboratories, Inc.
Malvern, Pennsylvania

The Photon approach to composition

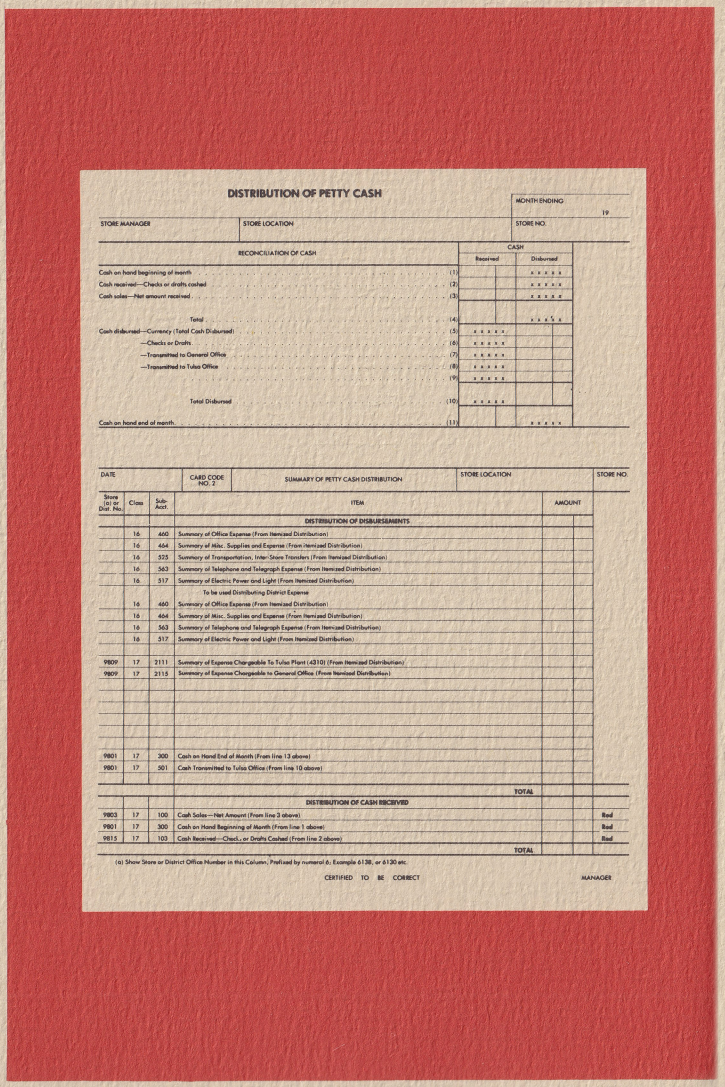
one machine

one operation

one operator

Newspaper ad display

Business forms



DISTRIBUTION OF PETTY CASH

MONTH ENDING ____ 19

STORE MANAGER | STORE LOCATION | STORE NO.

RECONCILIATION OF CASH		CASH Received	CASH Disbursed
Cash on hand beginning of month	(1)		
Cash received—Checks or drafts cashed	(2)		
Cash sales—Net amount received	(3)		
Total	(4)		
Cash disbursed—Currency (Total Cash Disbursed)	(5)		
—Checks or Drafts	(6)		
—Transmitted to General Office	(7)		
—Transmitted to Tulsa Office	(8)		
	(9)		
Total Disbursed	(10)		
Cash on hand end of month	(11)		

DATE | CARD CODE NO. 2 | SUMMARY OF PETTY CASH DISTRIBUTION | STORE LOCATION | STORE NO.

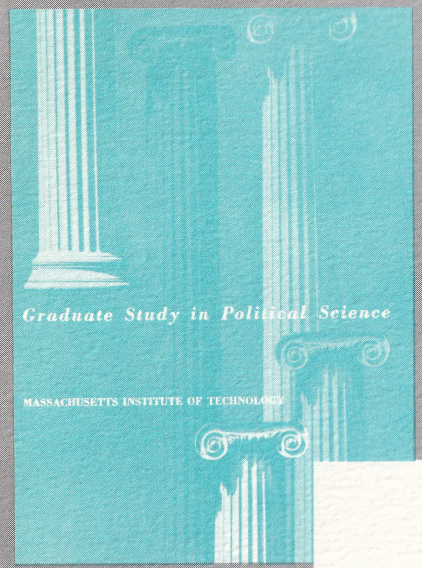
Store (S) or Dist. No.	Class	Sub-Acct.	ITEM	AMOUNT	
			DISTRIBUTION OF DISBURSEMENTS		
	16	460	Summary of Office Expense (From Itemized Distribution)		
	16	464	Summary of Misc. Supplies and Expense (From Itemized Distribution)		
	16	522	Summary of Transportation, Inter-Store Transfers (From Itemized Distribution)		
	16	563	Summary of Telephone and Telegraph Expense (From Itemized Distribution)		
	16	517	Summary of Electric Power and Light (From Itemized Distribution)		
			To be used Distributing District Expense		
	16	460	Summary of Office Expense (From Itemized Distribution)		
	16	464	Summary of Misc. Supplies and Expense (From Itemized Distribution)		
	16	563	Summary of Telephone and Telegraph Expense (From Itemized Distribution)		
	16	517	Summary of Electric Power and Light (From Itemized Distribution)		
9809	17	2111	Summary of Expense Chargeable To Tulsa Plant (4310) (From Itemized Distribution)		
9809	17	2115	Summary of Expense Chargeable to General Office (From Itemized Distribution)		
9801	17	300	Cash on Hand End of Month (From line 13 above)		
9801	17	501	Cash Transmitted to Tulsa Office (From line 10 above)		
			TOTAL		
			DISTRIBUTION OF CASH RECEIVED		
9803	17	100	Cash Sales—Net Amount (From line 3 above)		Red
9801	17	300	Cash on Hand Beginning of Month (From line 1 above)		Red
9815	17	103	Cash Received—Check, or Drafts Cashed (From line 2 above)		Red
			TOTAL		

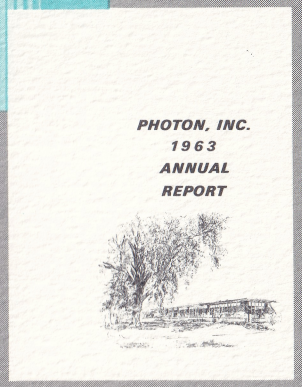
(a) Show Store or District Office Number in this Column, Prefixed by numeral 6. Example 6138, or 6130 etc.

CERTIFIED TO BE CORRECT

MANAGER

Pamphlets and brochures





Dictionaries

FUNK & WAGNALLS

NEW PRACTICAL

Standard DICTIONARY

[Reg. U.S. Pat. Off.]

a, **A** (ā) *n.* *pl.* **a's**, **A's** or **As**, **aes** (āz) 1 The first letter of the English alphabet: from Phoenician *aleph*, through the Hebrew *aleph*, Greek *alpha*, and Roman *A*. 2 Any sound of the letter *a*. See ALPHABET. — *symbol* 1 Primacy in class or order: grade *A* beef. 2 A substitute for the numeral 1: section *A*. 3 *Music* a One of a series of tones, the sixth in the natural diatonic scale of C, or the first note in the related minor scale. b A standard for tuning instruments: the pitch of this tone. c The written note representing this tone. d The scale built upon A. 3 *Chem.* Argon [symbol A].

a' (ə, *stressed* ā) *indefinite article or adj.* In each; to each; for each; twice a year: one dollar a bushel: equivalent to *per*. ♦ **a, per** *A* is preferred to *per*, except where *per* is required in business and statistical writing. [OE *an*, *on* in, on, at; orig. a prep.]

a' (ə, *stressed* ā) *indefinite article or adj.* One; any; some; each: before a vowel, *an*. See AN, ARTICLE.

Special uses: before plural nouns with *few*, *great*, *many*, *or good many*; with *on*, *at*, or *of*, denoting oneness, sameness; birds of a feather; before proper names referring to the qualities or character of an individual: He is a Hercules in strength. [reduced form of *an* used before consonant sounds]

♦ **a, an** *A* is used before a word beginning with a consonant sound, now including *h* when pronounced: *a* history, *a* hotel (*Brit.* often *an* hotel). Before an unaccented syllable beginning with *h* some writers prefer the older usage: *an* historical novel, *an* hysterical cry. *An* is used before a word beginning with a vowel sound, including one which is pronounced though not written: *an* X ray. *an* n dimensional figure.

a' (ə, ā) *v. Brit. Dial.* Have.

a' (ä, ō, ə) *pron. Brit. Dial.* He, she, it, they: an unstressed form.

a-¹ *prefix* On; in; at: *aboard*, *asleep*, *agog*, *ago-ing*. [OE *an*, on in, on, at]

a-² *prefix* Used as an intensive or without added meaning, as in *arise*, *abide*. [OE *ā*-]

a-³ *prefix* Of, from: *athirst*, *akin*, *anew*. [OE *of*, off, of]

a-⁴ *prefix* 1 Without; not: *achromatic*. 2 Apart from; unconcerned with: *amoral*. See note under ALPHA PRIVATIVE. [Reduced form of AN- used before consonant sounds]

a-⁵ Reduced var. of AB- before *m*, *p*, and *v*.

a- Reduced var. of AD- before *sc*, *sp*, and *st*.

aa (ä'ä') *n.* A brittle, scoriaceous substance consisting of sand, earth, stones, and melted lava, crusted and broken up. [<Hawaiian]

Aa (ä) Any of several small rivers of Europe, especially, two in Latvia, both emptying into the Gulf of Riga, and two in NW Germany.

Aa-chen (ä'kən, *Ger.* ä'khən) A city in western Germany on the Belgian border; capital of Charlemagne's empire: French *Aix la Chapelle*.

aal (äl) *n.* 1 An East Indian shrub (*Morinda tinctoria*), the root of which yields a red dye. 2 The dye. Also called *Indian mulberry*. [<Hind.]

Aa-land Islands (ō'lən) A Finnish archipelago at the entrance of the Gulf of Bothnia, 565 square miles, chief town, Mariehamn: also *Aland Islands*. *Finnish* Ah-ve-nan-maa (ä've-nän-mä').

Aal-borg (ôl'bôr) A port in northern Denmark: also *Alborg*.

a-a-lii (ä'ä-lē'ē) *n.* A small tropical tree (*Dodonæa viscosa*), native in Australia, Hawaii, Jamaica, and Madagascar, valued for its dark, hard, and durable timber. [<Hawaiian]

Aar (är) The longest river that is entirely in Switzerland, flowing 183 miles to the Rhine. Also **Aa-re** (är'ə).

Aa-rau (är'ou) A city in north central Switzerland.

aard-vark (ärd'värk') *n.* A burrowing, ant eating African mammal (genus *Orycteropus*) about the size of the pig, with long protrusile, sticky tongue to which the ants adhere, and strong, digging teeth; an ant bear. [<Afrikaans <Du. *aarde* earth + *vark* pig]

AARDVARK

aard-wolf (ärd'wōlf') *n.* A hyenalike, nocturnal, carnivorous mammal (*Proteles cristata*) of southern and eastern Africa, living chiefly on carrion and termites. [<Afrikaans <Du. *aarde* earth + *wolf* wolf]

Aar-hus (ôr'hōōs) A port in eastern Jutland, the second largest city in Denmark.

Aar-on (âr'ən, ar'ən) A masculine personal name. [<Hebrew *Aharon* ? enlightener]

— **Aaron** The first Jewish high priest; brother of Moses. *Ex.* iv, 14.

Aa-ron-ic (â-ron'ik) *adj.* Of or pertaining to Aaron, the high priest, or his descendants; hence, of or pertaining to a high priest: pontifical. Also **Aa-ron'i-cal**.

Aaron's rod 1 The rod cast by Aaron before Pharaoh, which became a serpent (*Ex.* vii, 9-13), and later blossomed (*Num.* xvii, 8). 2 *Archit.* A rod shaped molding, ornamented with sprouting leaves or with a single serpent twined about it. 3 A plant that flowers on long stems, as the mullein.

aas-vo-gel (äs'fō-gəl) *n.* A vulture. [<Afrikaans]

Ab (ab, äb) A Hebrew month. The 9th day of Ab is a fast day to commemorate the destruction of Jerusalem and the Temple, 586 B.C. and A.D. 70. The 15th day is a secular festival. See CALENDAR (Hebrew).

ab-¹ *prefix* Off; from; away: *abuse*, *abduct*, *abrogate*. Also *a-* before *m*, *p*, *v*, as in *avocation*; *abs-* before *c*, *t*, as in *abscess*, *abstract*. [<L *ab*, *a* from]

ab-² Assimilated var. of AD-.

a-ba (ä'bə) *n.* A sleeveless garment of camel's or goat's hair cloth worn in Arabia, Syria, etc.: also, the cloth. [<Arabic *ʿabā*]

ab-a-ca (ab'ə-kä, ä'bə-kä) *n.* The Philippine banana plant (*Musa textilis*) of the Philippine Islands. 2 The inner fiber of this plant, used for cordage. Also **Manila hemp**. [<Tagalog]

a-back (ə-bak') *adv.* Backward; aback. [<OE *on bæc* on or on the back]

ab-a-cus (ab'ə-kəs) *n.* *pl.* **cus-es** or **-ci** (-sī) 1 An ancient reckoning table with sliding balls still used in some Oriental countries. 2 *Archit.* A slab forming the top of a capital. For illustration see CAPITAL. [<L <Gk. *abax* counting table]

ABACUS (def. 1)

A-ba-dan (ä'bä-dän', ab'ə-dan') Chief town on Abadan Island in the Shatt al-Arab delta of SW Iran: oil refining and shipping center.

A-bad-don (a-bad'ən) In the Old Testament: 1 The bottomless pit; hell; the place of destruction. 2 The angel of the bottomless pit; Apollyon. [<Hebrew *ʾăbaddôn* destruction]

a-baft (a-baft', a-bäft') *adv. Naut.* Toward the stern; back; behind. — *prep.* Further aft than; astern of: *abaft* the mainmast. [OE *on be æftan* <*on* on, at + *be* about + *æftan*, adv., behind, back]

ab-a-lo-ne (ab'ə-lō'nē) *n.* A shellfish (genus *Haliotis*) having a perforated ear shaped shell lined with mother of pearl, which is used for inlaying, making buttons, beads, etc. Its meat is used for food. [<Sp.]

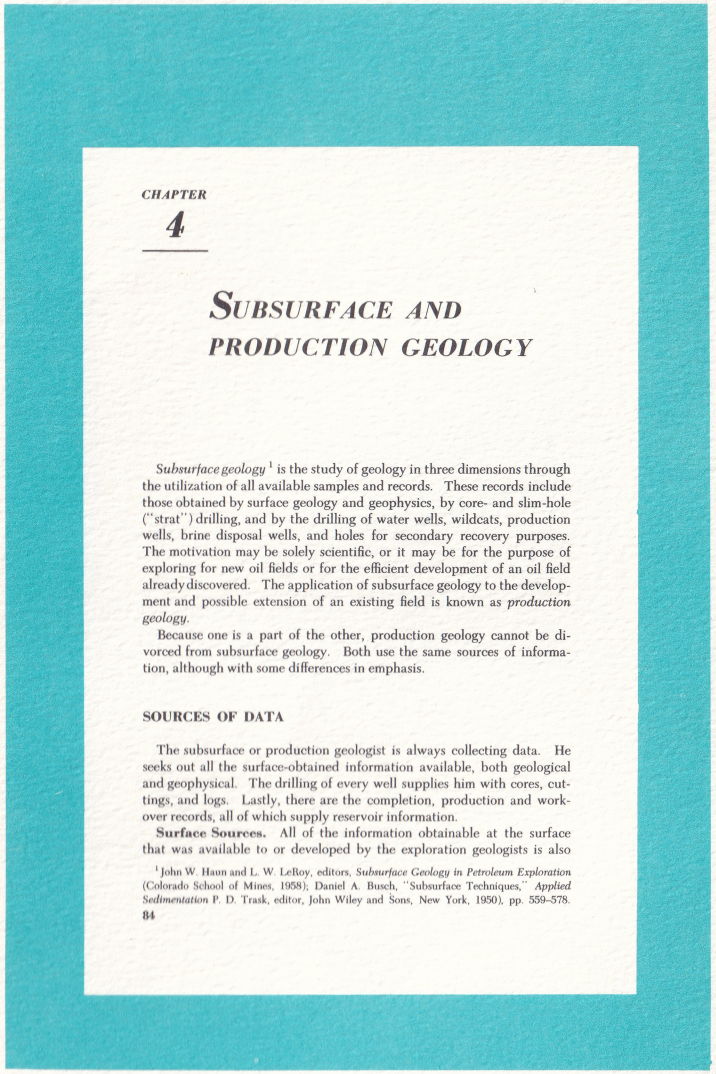
ab-am-pere (ab-am'pir) *n.* The cgs electromagnetic unit of current, equal to 10 absolute amperes. [<ABSOLUTE) + AMPERE]

a-ban-don (a-ban'dən) *v.t.* 1 To give up wholly; desert; forsake, as an effort or attempt. 2 To surrender or give over: with *to*: He *abandoned* his share to his partner. 3 To yield (oneself) without restraint, as to a feeling or pastime. — *n.* 1 Utter surrender to one's feelings or natural impulses. 2 Freedom. [<OF *abandoner* <*a bandon* under one's own control] — **a-ban'don-a-ble** *adj.* — **a-ban'don-er** *n.* — **a-ban'don-ment** *n.*

Synonyms (verb): abdicate, abjure, cease, cede, desert, discontinue, forgo, forsake, forswear, leave, quit, recant, relinquish, renounce, repudiate, resign, retract, surrender, vacate. *Abandon* denotes the complete and final giving up, letting go, or withdrawal from persons or things of any kind; *abdicate* and *resign* apply to office, authority, or power; *cede* to territorial possessions; *surrender* especially to military force, and more generally to any demand, claim, passion, etc. *Quit* carries an idea of suddenness or abruptness not necessarily implied in *abandon*, and may not have the same suggestion of finality. *Relinquish* commonly implies reluctance; the creditor *relinquishes* his claim. *Abandon* implies previous association with responsibility for or control of; *forsake* implies previous association with inclination or attachment; a man may *abandon* or *forsake* home or friends; he *abandons* an enterprise. *Forsake*, like *abandon*, may be used either in the favorable or unfavorable sense; *desert* is commonly unfavorable, except when used of localities; as, "The *Deserted* Village"; a soldier *deserts* his post. While a monarch *abdicates*, a president or other elected or appointed officer *resigns*. See also RENOUNCE. *Antonyms*: adopt, advocate, assert, cherish, claim, court, occupy, prosecute, protect, pursue, retain, seek, support, undertake, uphold, vindicate.

add, âce, câre, pälm; end, ēven; it, īce; odd, ōpen, ôrder; took, pōōl; up, ûrge; ə = u in fuse; bûrn; oil; out; pout; ɔ = a in above; ɛ in sickly; i in clarify; o in melon; u in focus; ch, check; g, go; ng, ring; th, thin; th, this; zh, vision. Foreign sounds: a, ä, ā, ã, ȧ, ȯ: see page 10. <, from; +, plus; ?, possibly.

Book production



CHAPTER

4

SUBSURFACE AND PRODUCTION GEOLOGY

Subsurface geology [1] is the study of geology in three dimensions through the utilization of all available samples and records. These records include those obtained by surface geology and geophysics, by core- and slim-hole ("strat") drilling, and by the drilling of water wells, wildcats, production wells, brine disposal wells, and holes for secondary recovery purposes. The motivation may be solely scientific, or it may be for the purpose of exploring for new oil fields or for the efficient development of an oil field already discovered. The application of subsurface geology to the development and possible extension of an existing field is known as *production geology*.

Because one is a part of the other, production geology cannot be divorced from subsurface geology. Both use the same sources of information, although with some differences in emphasis.

SOURCES OF DATA

The subsurface or production geologist is always collecting data. He seeks out all the surface-obtained information available, both geological and geophysical. The drilling of every well supplies him with cores, cuttings, and logs. Lastly, there are the completion, production and workover records, all of which supply reservoir information.

Surface Sources. All of the information obtainable at the surface that was available to or developed by the exploration geologists is also

[1] John W. Haun and L. W. LeRoy, editors, *Subsurface Geology in Petroleum Exploration* (Colorado School of Mines, 1958); Daniel A. Busch, "Subsurface Techniques," *Applied Sedimentation* P. D. Trask, editor, John Wiley and Sons, New York, 1950), pp. 559–578.

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